

REMARKS

Claims 1-7, 11, and 22-23 remain in the present application. Claims 8-10, 12-19, and 20-21 were previously canceled without prejudice. Claims 1-7 and 11 were previously amended. Claims 22-23 were previously added.

Claims Rejections

Claims 1-7 and 11 are rejected under 35 USC 102(e) as unpatentable over Lo et al. (US Patent 6,566,897). Applicants respectfully traverse this rejection.

Claim 1, as previously amended, recites as follows.

1. A method for **automated focusing** in an electron imaging system, the method comprising:

monitoring an energy filter cut-off voltage during electron imaging of a substrate; and

adjusting a stage bias voltage of the electron imaging system in negative correspondence with the energy-filter cut-off voltage so as to **maintain a focus** of the electron image.

(Emphasis added.)

Claim 1 pertains to a method for **automated focusing** of an image by adjusting the stage bias voltage in negative correspondence with the energy-filter cut-off voltage. As discussed in the response to the previous office action, FIG. 5 (reproduced below for convenience) shows experimental data indicating the negative correspondence between the stage bias voltage required to maintain focus **504** and the energy-filter cut-off voltage **502**.

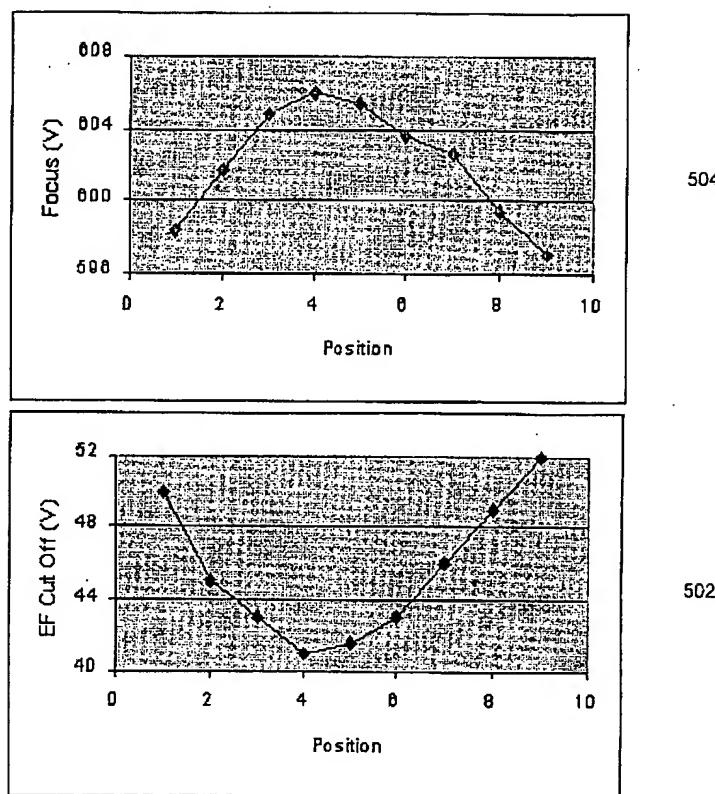


FIG. 5

The applicants respectfully submit that the limitation of monitoring the EF cut-off voltage 502 and adjusting the stage bias 504 in negative correspondence thereto so as to **maintain a focus** is not disclosed or suggested in the cited art.

The Lo et al. Reference

In contrast to the claimed invention which pertains to maintaining a focus of an electron image, the Lo et al. reference (USP 6,566,897) pertains to a technique for **improving the consistency and distinctiveness of contrast** in a voltage contrast image. Voltage contrast tools, such as that discussed in Lo et al., exploit voltage contrast to identify defects.

Note that maintaining focus (per the present application) and improving contrast (per the Lo et al. reference) are quite different. In fact, focusing the image is typically a pre-requisite which is performed before optimization of the contrast in voltage contrast imaging. For example, Lo et al. states (column 2, lines 23-34) as follows.

A focused, low voltage particle (electron) beam interrogates the charge states of the wafer's conductors. By comparing the voltage contrast image (or partial image) of a die with that of a reference (e.g. a neighboring die), one can locate defects in the die. Because this technique relies on voltage contrast variation to identify defects, it is important to have: (1) a uniform voltage contrast image in which the background contrast is uniform; (2) a consistent contrast for a circuit when that circuit is located in different areas of the field of view; and (3) a distinctive contrast (e.g., a large difference) between circuit elements with different underlying connections.

In other words, Lo et al. assumes that focusing is done **prior to** its method of voltage contrast imaging. Hence, focusing the electron beam and the voltage contrast between areas on the sample are two **independent** aspects.

The particular use of the energy filter is very specific in the Lo et al. reference. The energy filter is used in Lo et al. to enhance voltage contrast or increase voltage contrast uniformity by screening out electrons in a certain energy range. The use of the energy filter in Lo et al. is **unrelated to focusing**. As state Lo et al., "The energy filter can be used to **optimize voltage contrast** for certain wafer types by collecting secondary electrons with a specific retarding potential or energy range, for example in the range from zero to ~15 eV energy off the wafer." (Lo et al., column 7, lines 35-39.)

For the above-discussed reasons, applicants respectfully submit that claim 1, as amended, is now patentably distinguished over the Lo et al. reference.

Claims 2 and 3, as previously amended, depend from claim 1 and further clarify the claimed invention. For at least the above reasons discussed in relation to claim 1, claims 2 and 3 are also patentably distinguished over the cited art.

Claim 7, as previously amended, also depends from claim 1. For at least the above reasons discussed in relation to claim 1, claim 7 is also patentably distinguished over the cited art. Claim 7 further requires that said adjusting provides for rough focusing of the electron image and that fine focusing be provided by conventional contrast-based focusing.

Claims 4-6 depend from claim 1. Claims 4-6, as previously amended, recite alternative adjustments, instead of adjustments to the stage bias voltage. The cited art neither discloses nor suggests these alternative adjustments as used in correspondence with the EF cut-off to maintain focus of the electron image.

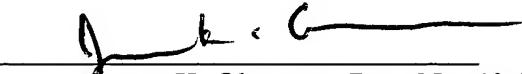
Apparatus claim 11 was previously amended and has limitations similar to method claim 1. New claims 22-23 depend from claim 11. Hence, for at least the above reasons discussed in relation to claim 1, claims 11 and 22-23 are also now patentably distinguished over the cited art.

Conclusion

Applicants respectfully submit that claims 1-7, 11 and 22-23 are now patentably distinguished over the cited art. Favorable action is respectfully requested.

Respectfully submitted,
Mark A. Neil, et al.

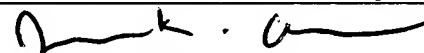
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